

THERMAL BARRIER COATINGS WITH LOWER POROSITY FOR IMPROVED
IMPACT AND EROSION RESISTANCE

ABSTRACT

[0041] A reduced thermal conductivity thermal barrier coating having improved impact and erosion resistance for an underlying metal substrate of articles that operate at, or are exposed to, high temperatures. This coating comprises a zirconia-containing ceramic composition having a c/a ratio in the range of from about 1.0057 to about 1.0123 and stabilized in the tetragonal phase by a stabilizing amount of a stabilizing metal oxide. The coating has a fraction of porosity of from about 0.15 to about 0.25, and an impact and erosion resistance property defined by at least one of the following formulas: (a) $I = \exp. [5.85 - (144 \times s) - (3.68 \times p)]$; and/or; (b) $E = [187 - (261 \times p) - (9989 \times s)]$, wherein $s = 1.0117 - c/a$ ratio; p is the fraction of porosity; I is least about 70 g/mil; and E is least about 80 g/mil. This coating can be used to provide a thermally protected article having a metal substrate and optionally a bond coat layer adjacent to and overlaying the metal substrate. The thermal barrier coating can be prepared by depositing the zirconia-containing ceramic composition on the bond coat layer, or the metal substrate in the absence of the bond coat layer.